

investigators agree in almost every particular regarding the disease, so that the main facts may be considered as thoroughly established, having been worked out independently by two competent observers.

It is rather unfortunate, however, that time should be spent in duplicating work, when there is so much to be done. In this particular case, certainly courtesy, not to say economy, demanded that investigation of the disease should not be assumed by the national department, but rather that the work should be left in the hands of the state experiment station, which had a thoroughly trained observer already engaged upon it. In 1895 Dr. Russell presented to the Springfield meeting of the A. A. A. S. a brief preliminary note on "A leaf rot of cabbage," for the purpose of eliciting information in regard to the disease. In this he alludes to certain striking symptoms which serve to identify the disease. His studies were continued in 1896, in the autumn of which year Dr. Smith began his investigation. Scarcely had he begun when he knew Dr. Russell was not only continuing his studies, but had been appealed to by the cabbage growers of Racine, Wis., to find out the cause of their serious losses. The material on which Dr. Smith's first studies were based was sent to him from that locality. While there is no civil law which compels the U. S. Department of Agriculture to keep out of, or withdraw even from work previously undertaken by a state experiment station, there is a law of courtesy which demands it, and Dr. Smith would have done well to heed it.—C. R. B.

### NOTES FOR STUDENTS.

ITEMS OF TAXONOMIC INTEREST are as follows: Marshall A. Howe<sup>5</sup> has published a revision of the Anthocerotaceæ of North America, containing ten species of Anthoceros (three of which are new), and two species of Notothylas. Six handsome plates accompany the paper. Anna M. Vail<sup>6</sup> has published a revision of the genus Acerates in the United States, recognizing seven species one of which is new. John K. Small<sup>7</sup> has published twenty-two new species of Eriogonum, and has constructed a new genus (*Acanthoscyphus*) upon the Californian *Oxytheca Parishii* Parry. H. Eggers<sup>8</sup> has published a new genus of Artocarpeæ from Ecuador, naming it *Poulsenia*.—J. M. C.

THE RECENT DISCOVERY of spermatozoids in *Cycas* and *Zamia* has given renewed interest to the study of the Cycadaceæ. Dr. D. H. Scott<sup>9</sup> has discovered in the peduncles of *Stangeria* and some other cycads the same

<sup>5</sup> Bull. Torr. Bot. Club 25: 1-24. 1898.

<sup>6</sup> Bull. Torr. Bot. Club 25: 30-39. 1898.

<sup>7</sup> Bull. Torr. Bot. Club 25: 40-53. 1898.

<sup>8</sup> Bot. Centralbl. 73: 49. 1898.

<sup>9</sup> The anatomical characters presented by the peduncle of Cycadaceæ. *Annals Bot.* 11: 399-420. 1897.

peculiar (mesarch) type of vascular bundle as has long been known to occur in cycad leaves. Mesarch bundles are found in certain fossils of cycadean stock (Bennettiteæ, Medulloseæ), in the leaves of Cordaiteæ, which like recent cycads had normal stem bundles, and in *Lyginodendron* and *Poroxyton*. Dr. Scott's discovery establishes a new link between the Cycadaceæ and the *Lyginodendrea* and, coupled with the occurrence of mesarch bundles in these palæozoic plants, makes it probable that this kind of bundle formerly occurred in the stems as well as leaves of cycads. He thinks the loss has been due to the early and increasing development of secondary tissues from the cambium.

Mr. W. H. Lang<sup>10</sup> has investigated the microsporangia of *Stangeria paradoxa*. The nearly mature sporangium has a wall five or six cell-layers in thickness, and the spore mother cells are immediately invested by three differentiated layers. The inner layer is the tapetum, which is not distinguishable till the sporangium is well grown, and then arises from the sporogenous mass. The other two specialized layers are derived from the sporangium wall and consist of flattened cells. The archesporium was not traceable to a single cell, but was a plate of four cells derived by a periclinal division of four large hypodermal cells.—W. R. SMITH.

THE RADICAL DIFFERENCE of opinion regarding bacterial structure which at present exists among investigators who, like Bütschli and Fischer, are most conversant with the subject-matter, naturally makes all interpretations of the observed facts appear more or less in the light of *obiter dicta*, and one of the latest contributions<sup>11</sup> to this interesting discussion can hardly escape being placed in the same category with the others. Meyer, nevertheless, brings to the problem a far richer contribution of fact than is contained in some of the recent polemical deliverances.

A large bacterium (regarded by Meyer as a new species, and named *Astasia asterospora*), which was found upon boiled carrot, afforded especially favorable material for investigation, and the author claims that the use of very high magnifications, combined with carefully chosen illumination, greatly facilitated his study. The spore of *Astasia* germinates under certain conditions in about six hours, and gives birth to a motile rod which divides and subdivides into new motile forms. After about twelve hours some of these motile individuals come to rest, secrete a gelatinous envelope, and become quiescent, although continuing to divide. Some, but not all, of these rods in the quiescent stage become sporangia, as Meyer terms them, and each

<sup>10</sup> Studies in the development and morphology of cycadean sporangia. *Annals Bot.* 11: 421-438. 1897.

<sup>11</sup> ARTHUR MEYER. Studien über die Morphologie und Entwicklungsgeschichte der Bakterien, ausgeführt an *Astasia asterospora* A. M. und *B. tumescens* Zopf. *Flora* 84: 185-248. 1897.

sporangium forms one true endospore. The cylindrical spores present a somewhat complicated structure: a two-layered membrane exists, the yellowish outer layer (exine) being raised into ten ridges which traverse the long axis. Viewed from the end the spore is star-shaped. The motile rods that come from the spores possess tufts of flagella, the small cells having but one tuft and the larger never more than from two to four. The individual flagella composing the tufts are exceedingly fine and delicate. These bunches of cilia are never found at the pole, but are always on the side of the cell, and are usually disposed asymmetrically. Meyer would found a new subfamily and genus (*Astasia*) upon this curious one-sided arrangement of ciliary tufts.

In nearly all stages of development, structures which Meyer regards as nuclei may be revealed by certain methods of staining. A staining solution that gave particular satisfaction was employed after fixation with osmic acid vapor, and was prepared as follows: 0.02<sup>gr</sup> ruthenium red, 6<sup>cc</sup> water, 2<sup>cc</sup> of 95 per cent. alcohol. The coloration obtained with this solution is permanent in glycerin and glycerin-gelatin, but does not hold in Canada balsam. With this method each cell shows one to two and rarely three to four deeply stained granular structures. Other nuclear stains were used with similar results, and Meyer looks upon the granules reacting to these stains as true nuclear substances. He rejects the view that bacteria are undifferentiated "protoplasts" or "archiplasts," as well as Bütschli's conception that the bacterial cell is chiefly nuclear substance surrounded by a mere fringe of cytoplasm.

A study of *B. tumescens* convinced Meyer that the process of spore formation occurs in this species in the same fashion as in *Astasia* and not in accordance with the statements of earlier workers. He is inclined to extend his observations upon these two species to a generalization covering the whole group of bacteria, and to believe that this method of spore-formation indicates close relationship of the bacteria to the Ascomycetes.—E. O. JORDAN.

MR. W. L. BRAY has recently published a short paper on the geographical distribution of the Frankeniaceæ, considered in connection with their systematic relationships.<sup>12</sup> This paper follows along the line of Engler's studies on the Rutaceæ,<sup>13</sup> and aims to correlate the facts of taxonomy with those of ecology and plant geography. The Frankenias are a small family of plants of extreme halo-xerophytic character and are found in nearly all salt steppes scattered all over the globe, and are always halophytic; hence they are peculiarly well adapted for a study in ecological phylogeny. The various species are taken up in detail by geographic regions, viz., the Mediterranean region, South Africa, Australia, South America, western North America and several oceanic islands. Australia, South America and the Mediterranean district

<sup>12</sup> Eng. Bot. Jahrb. 24: 395-417. 1897.

<sup>13</sup> See BOT. GAZ. 23: 220. 1897.

are the three large centers of development. The author divides the family into two groups, one of which includes nearly related forms occurring in most salt steppes, and the other including a large number of monotypic forms in isolated locations, and sharply distinct from each other, the remnants of a previous development. The character of the first group requires the supposition of migration within rather recent times, and the original center was probably Australia or the Mediterranean region, the American forms having come from Australia. A southern extratropical origin seems most likely. The means of dispersal is not clear, since the seeds are not adapted for flotation nor for clinging to objects, such as birds. The character of the second group leads Mr. Bray to the idea that the isolated forms are relics of a far wider distribution in the past, when there were, perhaps, much more extensive halophytic areas than exist today.—H. C. COWLES.

CONTINUING THE WORK of Kny, Mr. C. O. Townsend<sup>14</sup> has completed a series of experiments at Leipzig in the Pfeffer laboratory, whose results throw new light upon the precise effect of injury upon growth. The study was limited to seed plants, excepting a number of experiments upon *Phycomyces nitens*. Cuttings and introduction into an atmosphere of ether were the injuries employed. The fully tabulated results definitely establish that slight injury to root or shoot promptly accelerates the rate of growth, while, as the severity of the injury is increased, the acceleration becomes preceded by a varying period of retardation. In seed plants the minimum "latent period" observed was six hours, but in *Phycomyces* injury to the mycelium produced almost immediate retardation of the growth of the sporangia stalks, the normal rate being restored in from thirty to sixty minutes. Such irritation was found to act through distances up to 260<sup>mm</sup>, slight injuries to the root tips becoming soon apparent in changing the rate in the growing zone of the stem. The change may vary from the normal rate by 0 to 70 per cent., but only the most general results could be foretold from a specified injury; largely, of course, because the influence of turgor could not be eliminated.—J. G. COULTER.

A. PREDA<sup>15</sup> has recently investigated the embryo sac of several *Narcissus* forms, some of which were hybrids. In the hybrids various degrees of reduction were noted. Sometimes there was a small sac with egg apparatus and endosperm nucleus, often there was no trace of a sac, and in some cases not even the ovules were developed.

In referring to chromatophily the author quotes Auerbach, who would make the terms cyanophilous and erythrophilous almost synonymous with

<sup>14</sup>The correlation of growth under the influence of injuries. *Annals of Botany* 11: 509-532. 1897.

<sup>15</sup>Recherches sur le sac embryonnaire de quelque *Narcissées*. *Bulletin L'Herb. Boiss.* 5: 948-952. 1897.

male and female ; Strasburger, who makes the erythrophilous or cyanophilous condition depend upon abundant and impoverished nutrition respectively, and Zacharias, who says that the reaction depends upon the amount of phosphorus present in the nucleus, the nuclei rich in phosphorus being cyanophilous. He says that Zacharias' theory does not agree with Strasburger's, and also quotes Rosen's researches upon meristem as contradicting the nutrition theory. The author claims that the reactions in *Narcissus* are also at variance with Strasburger's views. It seems to us that the usual embryo sacs at least afford no contradiction to Strasburger's theory, and from the description *Narcissus* does not appear to be any exception to the rule. The fusion of polar nuclei is regarded as an act of fertilization and the endosperm as a new plant.

The author killed his material in alcohol, and though he imbedded it in paraffin, he preferred the ordinary razor to the microtome.—C. J. CHAMBERLAIN.

WÄCHTER has been carrying on experimental studies on water plants with a view to making clearer our knowledge of the relations existing between leaf form and external conditions.<sup>16</sup> Goebel's work on similar problems suggested the nature of the experimentation, and the author's results confirm Goebel's previous conclusions quite fully.<sup>17</sup> The first part of the paper treats of the influence of external agents on various monocotyls, especially *Sagittaria*. It is well known that leaves developed in deep water are narrow, while those developed in shallow water are much broader and often sagittate in some species. Goebel showed that this, like other leaf forms, is a light relation.<sup>18</sup> Wächter conducted all sorts of experiments, producing both types of leaves at will. Plants grown on the land developed broad leaves, while broad-leaved land forms developed narrow leaves when placed in water. Narrow leaves were produced in land forms that were insufficiently nourished, and also where grown in weak light. The author concludes that leaf form is not predetermined, but depends on environment, being fundamentally a matter of nutrition. The second part of the paper is a morphological and anatomical study of *Weddellinia*, and the third part describes the results of experimental work on *Nymphæa*, which are quite similar in general character to those described above for monocotyls.—H. C. COWLES.

IT HAS RECENTLY been shown by Professors Babcock and Russell<sup>19</sup> of the University of Wisconsin that the ripening of cheese is partly due, at least, to the presence of proteolytic enzymes, normally contained in milk, whose existence has not before been recognized. Heretofore the changes during the ripening process have been wholly ascribed to the action of bacteria.—J. C. A.

<sup>16</sup> *Flora* 83 : 367-397 ; 84 : 343-348. 1897.

<sup>17</sup> See *Bot. Zeit.* 38 : 752. 1880 ; *Flora* 72 : 1. 1889 ; *Biologische Schilderungen*, etc.

<sup>18</sup> *Flora* 80 : 96-116. 1895 ; 82 : 1-13. 1896.

<sup>19</sup> *Centr. f. Bakt. u. Paras.* 3<sup>2</sup> : 615-620. 1897.